ISSN 1346-7565 Acta Phytotax. Geobot. 58 (1): 51–55 (2007)

SHORT COMMUNICATION

Taxonomic Notes on *Cayratia tenuifolia* (Wight & Arn.) Gagnep., Vitaceae.

HIROSHI OKADA[1], HIROKAZU TSUKAYA[2] and MOTOHARU OKAMOTO[3]

[1]Botanical Gardens, Faculty of Science, Osaka City University, Katano, Osaka 576-0004, Japan; [2]Department of Biological Sciences, Graduate School of Science, University of Tokyo, 7-3-1 Hongo, Tokyo 113-0033, Japan; [3]Osaka Museum of Natural History, Nagai Park, Higashi-Sumiyoshi-ku, Osaka 546-0042, Japan

Through field observations, we concluded that *Cayratia tenuifolia* (Wight & Arn.) Gagnep. is distinct from *C. japonica* (Thunb.) Gagnep., although it is sometimes treated as a synonym of *C. japonica.* The floral disk of *C. tenuifolia* is yellow at anthesis and white after anthesis and the mature fruits are depressed obpyriform. In *C. japonica* the disk is orange at anthesis and becomes pink after anthesis and the fruits are globular. The chromosome number of *C. tenuifolia* is $2n = 40$.

Key words: *Cayratia japonica*, *Cayratia tenuifolia*, taxonomy, Vitaceae

Hatusima & Amano (1967) and Hatusima (1971) employed the name of *Cayratia tenuifolia* (Wight & Arn.) Gagnep. for plants with dentate leaflet margins from the Ryukyus, Japan. They treated *C. japonica* (Thunb.) Gagnep. var. *dentata* (Makino) Honda, described from Kagoshima, Kyushu, Japan (Makino 1909), as a synonym of *C. tenuifolia.* In his revision of *Cayratia* in Japan, Ohba (1999) used the name *C. japonica* var. *dentata* for plants with incised dentate leaflets. Previous taxonomic studies based on herbarium specimens found insufficient morphological characteristics to distinguish these plants from others (Hsu & Kuoh 1999, Ohba 1999). Although some plants have dentate leaflet margins, some individuals are intermediate between typical *C. tenuifolia*, *C. japonica* var. *dentata*, and *C. japonica* in leaf characteristics, making their identification difficult. As pointed out by Hsu & Kuoh (1999), *Cayratia* is quite variable in the shape and size of the leaves. We observed plasticity in leaf size in an individual of *C. japonica*, which had a terminal leaflet about 17 cm long (*Okada 5606*, OSA) in 2001, but in the following year the terminal leaflet was about 10 cm long. Thus the taxonomic status of plants with dentate leaflet margins is problematic. Hsu & Kuoh (1999) recently treated both *C. tenuifolia* and *C. japonica* var. *dentata* as synonyms of *C. japonica*, because of the highly variable leaf shape of *C. japonica.*

During our field studies of *Cayratia* (Okada & Tsukaya 2003, Okada *et al.* 2003, 2005), we found that the taxonomic confusion between these three taxa may be due to the lack of information on the plants in nature. During our field observations in various areas, we found diagnostic differences between *C. tenuifolia*, or *C. japonica* var. *dentata*, and *C. japonica*. The disk of *C. tenuifolia* is always yellow at anthesis, but becomes white after anthesis (Figs. 1B, 2), and the shape of the fruit is depressed obpyriform (Figs. 1C, 2). *Cayratia japonica* has an orange disk, which changes to pink (Fig. 1A), and globular fruit. Almost all specimens with a yellow disk and depressed obpyriform fruits, features unique in the genus, also have heavily serrated dentate leaves. Although Ohba (1999) employed the name *C. japonica* var. *dentata* for these plants, we agree with Hatusima & Amano (1967) and Hatusima (1971), that the correct name should be *C. tenuifolia.*

We confirmed Hatusima's (1971) report that *Cayratia tenuifolia* has a range that extends from the Malay Peninsula, Borneo, Taiwan and Okinawa to Kyushu, Japan according to our field observations and collections, and herbarium specimens kept in BO, FRIM, HAST, OSA and RYU. It is introduced in Honshu, Japan, probably though seeds brought in with soil of garden trees, *e.g.,* in Nishinomiya, Hyogo Prefecture.

Okada *et al.* (2003) reported a chromosome number $2n = 40$ for *Cayratia tenuifolia* collected in Motobu-cho, Okinawa Isl. (*Okada 5638*) and Mukogawa, Nishinomiya, Hyogo, Japan (*Okada 5623*).

Cayratia tenuifolia (Wight & Arn.) Gagnep. in Lecomte, Notul. Syst. (Paris) 1: 349 (1911); Hatus., Fl. Ryukyus: 395 (1971).

Vitis tenuifolia Wight & Arn., Prodr. Fl. Ind. Orient 1: 129 (1834).

Cissus tenuifolius (Wight & Arn.) Planch., Monogr. Phan. 5: 563 (1887).

Cissus japonica Thunb. var. *dentata* Makino, Bot. Mag. Tokyo 23: 249 (1909).

Cayratia japonica (Thunb.) Gagnep. var. *dentata* (Makino) Honda, Nom. Pl. Jap. 504 (1939).

Cayratia japonica (Thunb.) Gagnep. *sensu* Hsu & Kuoh, Bot. Bull. Acad. Sin. 40: 329 (1999), p. p.

Vines, climbing, herbaceous, sometimes adventitious buds from expanded roots, tendrils forked 2 or 3 times. Leaves pedate; leaflets 5(-7); terminal leaflet ovate to elliptic or oblong, base acute to cuneate, margin heavily serrate to dentate, apex acute, 4-8 cm long, 2-4 cm wide; petiolule 2-4 cm long. Disk of flowers yellow at anthesis, becoming white after anthesis. Fruits depressed obpyriform.

Notes. We did not notice differences in the size of the petals and shape of the stamens between *Cayratia tenuifolia* and *C. japonica* as reported by Hatusima (1971).

Japanese name. Hiiragi-yabukarashi

Specimens examined. JAPAN. **Honshu:** Hyogo Pref., Nishinomiya, Takasu-cho, Mukogawa-Danchi (estate), naturalized, July 21, 1999, *M. Okamoto s. n.* (*OSA 149627*), *H. Okada 5623* (Osaka City Univ.). **Kyushu:** Nagasaki Pref., Nagasaki, Kaminoshima, Kaminoshima Park, summit of the park, Sept. 15, 2003, *H. Okada 6011* (OSA, Osaka City Univ.); Kagoshima Pref., Kikai Isl., July 28, 1975, *K. Yoshinaga 614* (*RYU 36995*); Amami Isl., Kasari-cho, Amami Airport, June 22, 2003, *H. Okada 5646* (OSA, Osaka City Univ.). **Okinawa:** Okinawa Isl., Okinawa Pref., Kunigami-gun, Motobu-cho, Ishikawa, May 28, 2002, *H. Okada 5638* (OSA, Osaka City Univ.); Motobu-cho, Ishikawa, North Gate of Okinawa Memorial Park, May 29, 2002, *H. Okada 5639* (Osaka City Univ.); Koza, Teruya, *Y. Nakasone s. n.* (OSA 585); Onna village, June 11, 1972, *R. Tomoyori s. n.* (RYU 2989); Nanjo city (26°09'40"N, 127°42'51"E), *H. Okada 6006* (Osaka City Univ.); Shimajiri-gun, Haebaru (26°11'03"N, 127°44'02"E), March 21, 2006, *H. Okada 6005* (Osaka City Univ.); Shimajiri-gun, Tomigusuku (26°10'29"N, 127°40'07"E), March 21, 2006, *H. Okada 6007* (Osaka City Univ.); Shimajiri-gun, Gusigami (26°06'56"N, 127°44'13"E), March 21, 2006, *H. Okada 6008* (Osaka City Univ.); Itoman city, Makabe (26°05'50"N, 127°41'24"E), March 21, 2006, *H. Okada 6009* (Osaka City Univ.); Itoman city, Zaha (26°08'24"N, 127°41'23"E), March 21, 2006, *H. Okada 6010* (Osaka City Univ.); Izena Isl., Shiroyama, July 22, 1973, *Hatusima 34798A* (*RYU 14700*), Ishigaki Isl., Ishigaki city, Entrance of Mt. Pensa, March 25, 2005, S. *Matsumura 50001* (URO); Iriomote Isl., Komi, July 26, 1972, *Hatusima 32982* (*RYU 4993*).

TAIWAN. Taipei Hsien, Shihmen Hsiang, Linshanpi (121°30'13"E, 25°17'15"N) (Taiwan Grid 300712E, 2797848N), ca. 0 m elev., June 13, 1999, *K. F. Chung 1164* (HAST); Taipei, Yangmingshan, Dec. 21, 1961, *T. I. Chuang 4727* (HAST); Shirmen, northern coast, July 6, 1986, *C.-I Peng 9343* (HAST); Keelung, Ching Jen-hu Park (25°09'27.4"N, 121°42'19.5"E), about 130m alt.,

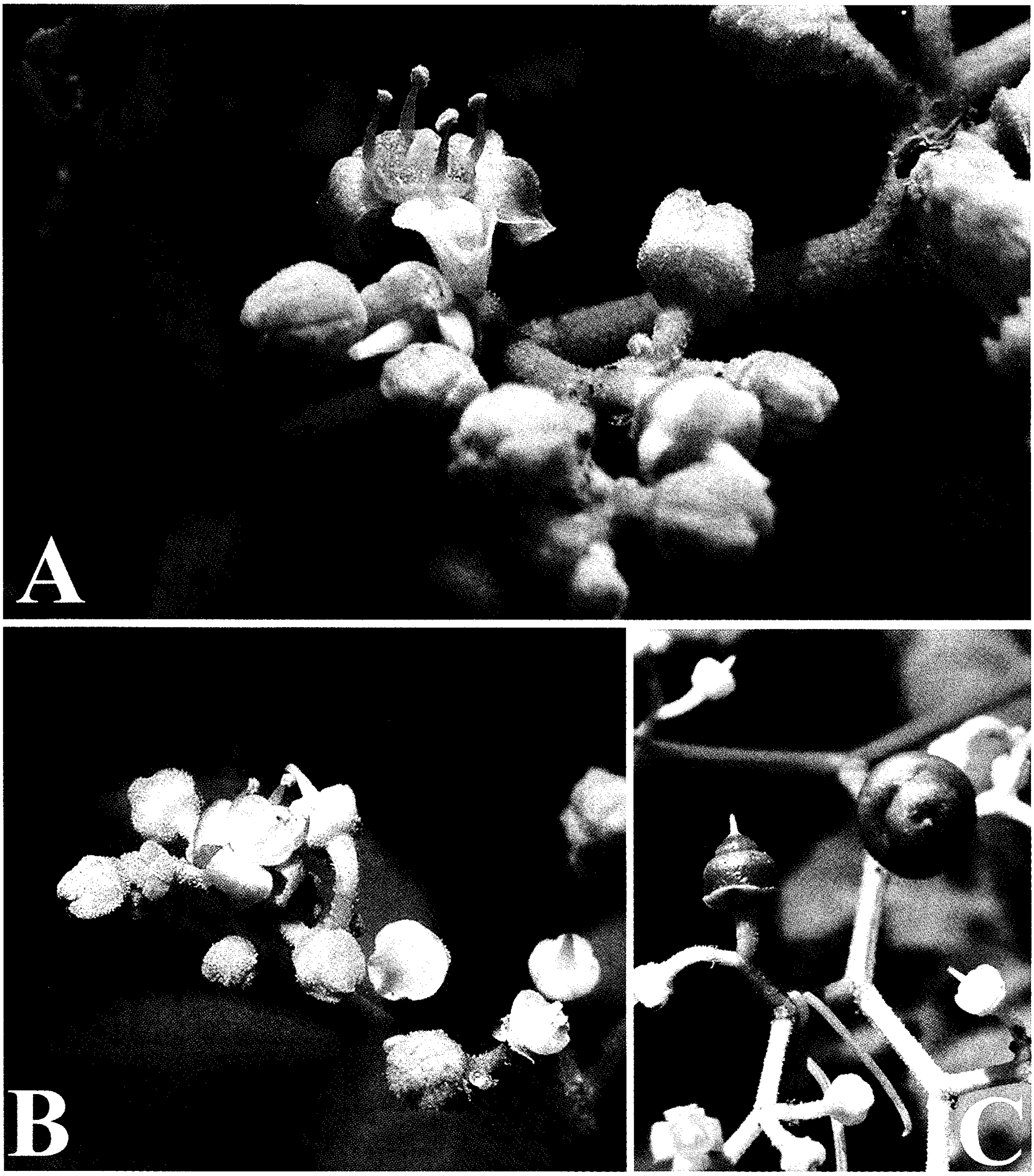

FIG. 1. A: Staminate flowers of *Cayratia japonica* at and after anthesis, about ×10. B: Flowers of *C. tenuifolia*, about ×6. C: Young fruits of *C. tenuifolia*, about ×4. Note difference in disk color between species. Photo from individuals at A: Katano, Osaka, B: Motobu, Okinawa, C: Nishinomiya, Hyogo.

June 4, 2004, *H. Okada 5672* (Osaka City Univ.); Wu-lai Hsiang, Meng-meng-ku, ca. 100m elev., Dec. 26, 2000, *C. T. Lu et al. 510* (HAST); Ilan Hsien, Yuanshan Hsiang, a cemetery opposite Leikungpi (a lake) (121°43'01"E, 24°45'55"N) (Taiwan Grid: 322518E, 2740020N); ca. 100m elev., Nov. 15, 2000, *C. H. Lin 967* (HAST); Yuanshanfuyuan, near Pitouhu (an artificial lake) (121°41'17"E, 24°45'28"N) (Taiwan Grid 319596E, 2739179N), ca. 150m elev., Nov. 15, 2000, *C.-H. Lin 900* (HAST); Tong-ao south from Suao (24°30'51.2"N,

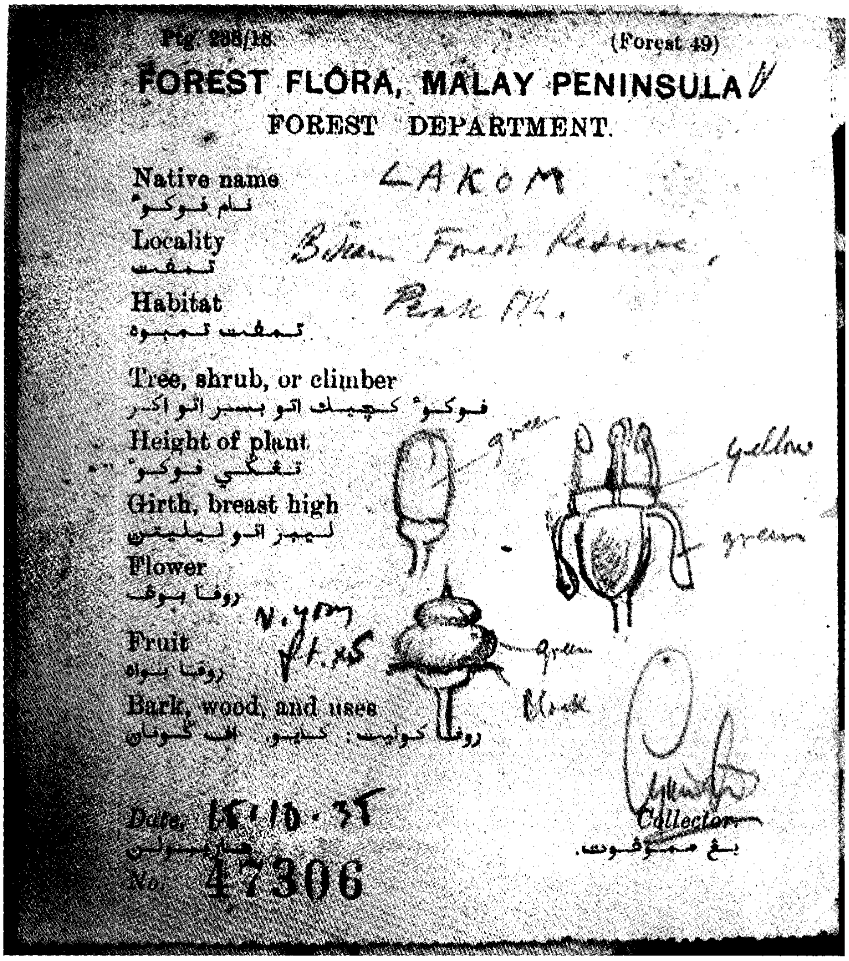
green
yellow
green
green
black

Fig. 238/18. (Forest 49)

FOREST FLORA, MALAY PENINSULA

FOREST DEPARTMENT.

Native name نام فوكو LAKOM

Locality تمفت Bikam Forest Reserve,

Habitat تمفت تمبوه Peak Ft.

Tree, shrub, or climber فوكو كچيك اتو بسر اتو اكر

Height of plant تڠڬي فوكو

Girth, breast high ليمر اتو ليليتن

Flower روفا بوڠ

N.4m

Fruit روفا بواه Fl.x5

Bark, wood, and uses روفا كوليت: كايو، اڤ ڬوناڽ

Date هاريبولن 18.10.38

No. 47306

Collector يڠ مڠوفوت.

FIG. 2. Drawings on label of herbarium specimen (*C. F. Symington 47306*, FRIM). Note explanation of disk color and shape of fruit.

121°50'08.1"E), about 15m alt., June 6, 2004, *H. Okada 5676* (Osaka City Univ.); Hsinchu Hsien, Hengshan Hsiang, along Yulo His (River), June, 12, 1990, *C.-I Peng 13298* (HAST); Chutung, along Yulo-His (River), ca. 140m elev., July 17, 1990, *W. P. Leu 522* (HAST); Miao-Li Hsien, Miaoli, between Tunglo and Wumeikeng, a hilly burial ground along County Rd. #128, 5.5km west of intersection of Freeway #1 and Co. Rd. #128, June 23, 1988, *C.-I Peng 11562* (HAST); Taichung Hsien, Taitung, between Dongching and Yeyin, Lanyu, roadside, ca. 0-10m elev., June 8, 1983, *C.-I Peng 5193* (HAST); Taichung, Tachiahsikou, Sept. 14, 1993, *S. T. Chiu 2069* (HAST), Dec. 27, 1994, *S. T. Chiu & C. N. Chen 2746* (HAST); Nantou Hsien, Nantou, enroute from Tungpu Hot Spring to Bunong Aboriginal Dwelling, ca. 1200-1100 m, July 6, 1985, *C.-I Peng 8227* (HAST); Kaoshiung Hsien, Kaoshiung, Shoushan (22°37'41"N, 120°15'32"E), July 9, 1996, *Yang, C.-S. 691* (HAST).

MALAYSIA. **Malay Peninsula:** Kedah, C. Inas FR (Forest Reserve), compt. 6, Sungei Kupung, Feb. 8, 1968, *T. C. Whitmore PRI 4696* (FRIM); Pahang, Ulu Sungai Sat, July 21, 1970, *Mohd Shah & Mohd. Noor 1854* (FRIM); Bukit Raka, Jan. 27, 1939, *C. F. Symington 48610* (FRIM); Perak, Bikam Forest Reserve, Oct. 18, 1938, *C. F. Symington 47306* (FRIM); Selangor, Ulu Langat, Bukit Batu Pechah, K. Pansom, April 27, 1960, *Gadoh anak Umbai 2126* (FRIM); Negeri Sumbilan, Jelebu dist. Serdng Forest Reserve, Simpang Pertang, *E. Gardener EG 2089* (FRIM); Johor, Kluang Forest Reserve, near Kampong Gajah, ca. 100 ft., Nov. 24, 1967, *Alphonso & Sidak S.202* (FRIM).

INDONESIA. **Borneo:** C. Kalimantan, Dist. Murung Raya, Tumbang Tohan, upper village from Tumbang Naan (00°09'03"S, 113°45'04"E), beside Sungai (River) Joloi, an upper stream Sungai Barito, Dec. 26, 2004, *H. Okada et al. KT-421* (BO, TI).

Key to the Species of the Genus *Cayratia* in Japan

1a. Stem glabrous, terminal leaflet linear-oblong to lanceolate, immature fruits green or crimson, turning black ········ *C. corniculata* Gagnep.
1b. Stem puberulous, terminal leaflet ovate to lanceolate-oblong, immature fruits green, turning black ··· 2
  2a. Disk of flower orange, turning pink after anthesis; fruits globular ········ *C. japonica*
  2b. Disk of flower yellow, turning white after anthesis; fruits depressed obpyriform ········ *C. tenuifolia*

We express our cordial thanks to Dr. C-I Peng, Herbarium of Academia Sinica, Taiwan (HAST), for kindly arranging our field study in Taiwan and for permission to examine herbarium specimens. Dr. M. Kato provided an opportunity for one of us (Hiroshi Okada) to examine herbarium specimens at FRIM. Mr. Y. Takaesu and S. Yamaguchi, Okinawa Prefectural Agricultural Experiment Station, guided Hiroshi Okada to various field sites in Okinawa and Dr. S. Matsumura provided materials. We also thank the curators of the herbaria BO, FRIM, HAST and RYU for allowing us to study specimens in their care. This study was partly supported by a Grant-in-Aid of Scientific Research from the Japan Society for the Promotion of Science.

References

Hatusima, S. 1971. Flora of the Ryukyus. Okinawa Seibutsu Kyouiku Kenkyukai, Naha. (in Japanese)

—— & T. Amano 1967. Flora of Okinawa. Okinawa Association of Biology Education. (in Japanese)

Hsu, T.-W. & C.-S. Kuoh. 1999. *Cayratia maritima* B. R. Jackes (Vitaceae), a new addition to the flora of Taiwan. Bot. Bull. Acad. Sin. 40: 329-332.

Makino, T. 1909. Observations on the flora of Japan. *Cissus japonica* var. *dentata* Makino, var. nov. Bot. Mag. Tokyo 23: 249-250.

Ohba, H. 1999. Vitaceae. *In*: Iwatsuki, K., D. E. Boufford & H. Ohba (eds.), Flora of Japan 2c: 119-125.

Okada, H. & H. Tsukaya. 2003. Chromosome observations of *Cayratia* species, Vitaceae. Acta Phytotax. Geobot. 54: 177-179.

——, —— & M. Mohamed. 2005. Chromosome observations in species of *Cayratia* (Vitaceae) II. Intraspecific polyploidy in *C. trifolia*. Vitaceae. Acta Phytotax. Geobot. 56: 203-206.

——, —— & M. Okamoto. 2003. Intra-specific polyploidy and possible occurrence of some genetic types for pollen development in *Cayratia japonica*, Vitaceae. Acta Phytotax. Geobot. 54: 69-75.

Received May 18, 2006; accepted February 9, 2007